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NUCLEAR NONPROLIFERATION

Concerns With the U.S. International Nuclear Materials Tracking System

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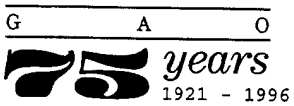

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Mr. Chairman and Members of the Committee:

We are pleased to be here today to testify on the ability of the United States to track exported U.S. nuclear materials as the Congress deliberates the proposed Agreement for Cooperation between the United States and the European Atomic Energy Community Concerning the Peaceful Uses of Atomic Energy (U.S.-EURATOM agreement). This agreement controls the exports of certain nuclear materials, nuclear reactors, and their major components and parts between the United States and 15 western European countries.[1] Keeping track of the growing amount of nuclear materials is especially important because of the breakup of the Soviet Union and increases in both domestic and international terrorism. Our testimony is primarily based on three reports addressed to this Committee.[2]

In summary, DOE's nuclear materials tracking system, which serves as the primary source of information for the United States to track U.S. nuclear materials exported to foreign countries, has significant limitations. Furthermore, recent information suggests that DOE's replacement tracking system faces a high probability of failure because it has not been completely developed and tested.

In 1994, we reported that DOE's system for tracking nuclear materials exported to foreign countries does not have all the information needed to track the specific current location (facility) and status of all nuclear materials of U.S. origin. The system does not contain this information primarily because the amounts and types of data and the reliability of the data entered into the system depend largely on the data-reporting requirements under international agreements for peaceful nuclear cooperation, such as the proposed U.S.-EURATOM agreement, as well as on the willingness of foreign countries and of U.S. and foreign facilities to report complete and accurate data. For example, the U.S. tracking system may not contain correct and current data on which EURATOM country has U.S.-supplied nuclear materials or at what facilities these materials are located. According to a State Department official, negotiations are under

[1]EURATOM is composed of the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. These countries are treated as a single entity for the purposes of trade in and transfers of nuclear materials to the United States.

[2]Nuclear Nonproliferation: U.S. International Nuclear Materials Tracking Capabilities Are Limited (GAO/RCED/AIMD-95-5, Dec. 27, 1994); Nuclear Nonproliferation: Information on Nuclear Exports Controlled by the U.S.-EURATOM Agreement (GAO/RCED-95-168, June 16, 1995); Department of Energy: Poor Management of Nuclear Materials Tracking System Makes Success Unlikely (GAO/AIMD-95-165, Aug. 3, 1995).

way to develop an administrative arrangement through which EURATOM would, among other things, annually report to the United States the amount of U.S.-origin material within EURATOM. However, this information would not show the amounts of nuclear material on a country-by-country or facility-by-facility basis.

Further complicating the lack of complete tracking data, the databases operated by DOE, NRC, and the Department of Commerce, which account for exports of nuclear materials, show differences in the amounts of nuclear materials exported. In June 1995, we reported that NRC's export licensing database, DOE's tracking system database, and Commerce's National Trade Data Bank did not agree on the amount of materials exported. Our analysis of the data from these databases shows that from 1980 through 1994, the United States exported about 32.6 million kilograms (kg) and about 11 million kgs of nuclear materials to EURATOM and Japan, respectively, and Japan transferred about 4.7 million kgs of U.S.-origin nuclear materials to EURATOM. The value of the U.S. nuclear material exported from 1989 through August 1994 was about $1.1 billion for EURATOM and $4 billion for Japan.

Moreover, DOE may have missed an opportunity to improve its nuclear materials tracking system. In August 1995, we reported that DOE's planning for a replacement tracking system was undisciplined and poorly controlled. As a result, we stated that the replacement system's success was unlikely. We concluded that DOE's disregard for basic system development practices was inconsistent with the importance of the system and that it was not in DOE's best interest to disconnect the existing tracking system and replace it with an undocumented and untested new system. However, DOE stopped using the existing system on September 1, 1995, and replaced it with the new tracking system.

Before discussing these issues further, we would like to provide some background information on DOE's nuclear materials tracking system.

Background

Hundreds of tons of plutonium and highly enriched uranium have accumulated worldwide, and inventories of plutonium are expected to continue to grow in years to come as a result of reprocessing or recovering activities. Tracking and accounting for these and other nuclear materials are important to 1) ensure that nuclear materials are used only for peaceful purposes; 2) help protect nuclear materials from loss, theft, or other diversion; 3) comply with international treaty obligations; and

4) provide data to policymakers and other government officials. The United States regulates and controls its exports of civilian-use nuclear materials through three mechanisms—agreements for cooperation, export licenses, and subsequent arrangements (regulatory controls over certain cooperative arrangements for the supply, use, or retransfer of nuclear materials). Certain controls in the agreements for cooperation are designed to assure both the United States and the recipient nation or group of nations that materials transferred between parties will be used for authorized purposes only and will be properly safeguarded. DOE's tracking system contains data on nuclear materials supplied and controlled under international agreements, foreign contracts, import/export licenses, government-to-government approvals, and other DOE authorizations, such as authorizations to retransfer U.S.-supplied nuclear materials between foreign countries. The tracking system also maintains and provides DOE with information on domestic production and materials management, safeguards, physical accountability, financial and cost accounting, and other data related to nuclear materials accountability and safeguards for NRC licenses.

U.S. Ability to Track Nuclear Materials Internationally Is Limited

In December 1994, we reported that the U.S. system for tracking nuclear materials exported to foreign countries[3] did not have all the information needed to track the specific current location (facility) and status of nuclear materials of U.S. origin. For example, the system does not track exported U.S. nuclear materials that are moved from facility to facility within countries, nor does it show the current status of nuclear materials (e.g., irradiated, unirradiated, fabricated, burned up, or reprocessed). The system does not contain this information primarily because the amounts and types of data and the reliability of the data entered into the system depend largely on the data-reporting requirements under international agreements for peaceful nuclear cooperation, as well as on the willingness of foreign countries and of U.S. and foreign facilities to report complete and accurate data. For example, neither the previous nor the proposed U.S.-EURATOM agreement requires EURATOM countries to inform the United States of retransfers of U.S.-supplied nuclear materials from one EURATOM country to another or to report alterations to the status of U.S.-supplied nuclear materials in these countries. In addition, none of the existing agreements for cooperation require foreign countries to report intracountry transfers of U.S.-supplied nuclear materials from one facility to another. According to a State Department official, negotiations are

[3]DOE's tracking system is known as the Nuclear Materials Management and Safeguards System (tracking system).

under way with EURATOM to develop an administrative arrangement through which EURATOM would, among other things, annually report to the United States the amount of U.S.-origin material within EURATOM. However, this information would not show the amounts of nuclear material on a country-by-country or facility-by-facility basis.

At the time of our review, the tracking system did contain data on the status of U.S.-supplied nuclear materials in Sweden, Australia, and Canada because the United States performed annual reconciliations with these countries. These reconciliations compared the U.S. tracking system's data with records from each of the foreign countries. The U.S. tracking system's data were then adjusted, where necessary, to reflect the current status of U.S.-supplied materials in each of these countries. However, for foreign countries that did not participate in reconciliations with the United States, the tracking system contained data only on export transactions and on transactions requiring U.S. approval that occurred after export, as required by the agreements for cooperation. At the time of our review, the United States had started an initial nuclear materials reconciliation with Japan.

According to DOE officials, DOE's tracking system was not intended or designed to track foreign countries' nuclear materials that were never imported into the United States. Accordingly, the United States relies on other sources to obtain information on nuclear materials of both U.S. and foreign origin that are located in foreign countries. For example, the United States relied on DOE and other agencies to help determine the quantity, location, origin, and characteristics of commercial plutonium in noncommunist countries. DOE also uses data provided by intelligence sources and technology to support nuclear materials nonproliferation programs.

U.S. Databases Differ on the Amounts of Nuclear Materials Exported

In developing information on nuclear exports controlled by the U.S.-EURATOM agreement (see app. I), we found that U.S. databases containing export information—specifically, NRC's export licensing database, DOE's tracking system database, and Commerce's National Trade Data Bank—did not agree on the amounts of materials exported. For example, in its comments on our draft report, NRC noted differences between Commerce's database and NRC's export licensing database. Specifically, NRC officials said that they were puzzled by the reported plutonium sales to countries, particularly Denmark, Greece, and Portugal. At the time our report was issued, NRC officials said that these countries had very small nuclear research programs and no nuclear power

programs; therefore, the officials doubted that these countries had, in fact, imported plutonium from the United States. In addition, NRC's export licensing database showed no licenses for exports to Greece or Portugal, one small (0.005 kg) plutonium export case for Denmark, and only three plutonium export cases for Spain. However, NRC noted that U.S-supplied nuclear materials to any country within EURATOM can be freely transferred within EURATOM without prior notification to, or approval by, the United States. Hence, according to NRC, it was possible, although not likely, that U.S.-supplied plutonium had gone to the countries in question and had been reported to Commerce's database without appearing in NRC's export licensing records.

Our analysis of the data from DOE's and Commerce's databases shows that from 1980 through 1994, the United States exported about 32.6 million kgs and about 11 million kgs of nuclear materials to EURATOM and Japan, respectively, and Japan transferred about 4.7 million kgs of U.S.-origin nuclear materials to EURATOM. The value of the U.S. nuclear material exported from 1989 through August 1994 was about $1.1 billion for EURATOM and $4 billion for Japan.[4] Depleted, natural, and enriched uranium were the largest components of the nuclear materials exported to EURATOM and Japan.

Poor Management Makes Success of Replacement Nuclear Materials Tracking System Unlikely

In December 1994 and August 1995, we reported on DOE's progress in developing a new nuclear materials tracking system. Because the previous tracking system was an older computerized system, DOE decided to replace and modernize it. However, DOE decided merely to replicate the functions of the existing system, whose limitations will, therefore, remain. In December 1994, we reported that DOE had not adequately planned the development of the new replacement system. For instance, DOE did not identify users' needs or adequately explore design alternatives that would best achieve these needs in the most economic fashion. DOE could have reduced the likelihood that these planning deficiencies would occur by following the software development requirements set forth in its own software management order. Accordingly, we recommended that DOE determine users' requirements, investigate alternatives, conduct cost-benefit analyses, and develop a plan to meet identified needs before investing further resources in a new tracking system. However, DOE continued to develop the system without performing these steps because it believed that its planning was sufficient and that delaying the

[4]We reported on the amount and value of the U.S.-origin nuclear materials exported to Japan because the expiration of the U.S.-EURATOM agreement would prohibit Japan from transferring U.S.-origin nuclear materials to EURATOM.

implementation of the replacement system would not be cost-effective. DOE provided no analysis to support this assertion.

In August 1995, we reported that the planning risks identified in our previous report were magnified by additional system development risks that DOE was not adequately addressing. For example, the subcontractor developing the replacement tracking system had not documented the system's development process. Because little system documentation existed and the contract did not require any interim deliverables describing the progress of the system's development before the complete system's delivery, DOE could not determine the status of the system's development. In addition, the subcontractor did not place the software under configuration management. Sound configuration management helps ensure that the status of the system's software is known at all times and that, when more than one programmer is making changes and updating the software, all changes are consistent and are being written to the same software version.

Finally, we found that DOE planned to pay for, install, and use the replacement tracking system without requiring that it pass acceptance testing. Acceptance testing demonstrates that a system meets hardware, software, and performance requirements and users' operational needs. Though always important, such testing seems particularly critical in light of DOE's inadequate planning and the lack of basic system development discipline and sound practices. Without acceptance testing, DOE has no assurance that the replacement tracking system will ever perform as intended. Therefore, we recommended that DOE immediately terminate any further development of the replacement system and continue using its existing tracking system. However, on September 1, 1995, DOE stopped using the existing tracking system and began using the replacement tracking system. We believe that the size and complexity of DOE's nuclear materials tracking system and its pivotal role in meeting U.S. treaty and statutory obligations should have compelled DOE to ensure that the system was planned and designed properly to ensure its accuracy.

Recent information from officials familiar with DOE's replacement tracking system have also raised concerns about the replacement system. Specifically, in a December 6, 1995, report, the Lawrence Livermore National Laboratory technical advisory committee that was responsible for overseeing the development of the replacement tracking system concluded that this system faced a high probability of failure because the system had

not been completely developed and tested. As a result, the Committee recommended that the replacement system not be accepted as delivered.

Mr. Chairman, this concludes my prepared statement. We would be happy to answer any questions that you or Members of the Committee may have.

Information on Nuclear Exports Controlled by U.S.-EURATOM Agreement (1980-94)

The largest amount of U.S. nuclear materials exported to EURATOM and Japan during the last 15 years consisted of depleted, natural, and enriched uranium. Table I.1 shows the total amount of U.S. nuclear materials exported to EURATOM from 1980 through 1994 that are controlled by the agreement. Table I.2 summarizes the total amount of nuclear materials exported to Japan during the same period.

Table I.1: Summary of U.S. Nuclear Materials Exported to Euratom, 1980-94

In kilograms

Nuclear material	Quantity
Depleted uranium	14,649,985.000
Natural uranium	11,886,101.000
Enriched uranium	6,049,307.000
Thorium	3,188.000
Uranium-233	0.062
Plutonium	32.800
Plutonium-242	0.094
Plutonium-238	0.099

Table I.2: Summary of U.S. Nuclear Materials Exported to Japan, 1980-94

In kilograms

Nuclear material	Quantity
Enriched uranium	10,031,810.000
Natural uranium	917,621.000
Depleted uranium	7,937.000
Thorium	2,705.000
Uranium-233	0.056
Plutonium	2.420
Plutonium-242	0.007
Plutonium-238	0.019

Quantities of U.S.-Origin Nuclear Materials Transferred From Japan to Euratom From 1980-94

Japan uses enriched and natural uranium as fuel for nuclear power reactors. The used or spent fuel is transferred to EURATOM for reprocessing, which chemically separates the depleted uranium and plutonium. Enriched uranium, totaling 4,542,383 kgs, was the largest component of the U.S.-origin nuclear materials transferred from Japan to EURATOM. From 1980 through 1994, Japan transferred to EURATOM between 115,651 kgs and 404,935 kgs annually of enriched uranium. Japan also exported about 37,187 kgs of plutonium to EURATOM during this

period. Table I.3 summarizes the total amount of U.S.-origin nuclear materials that Japan transferred to EURATOM during the period.

Table I.3: Summary of U.S.-Origin Nuclear Materials Transferred From Japan to Euratom, 1980-94

In kilograms

Nuclear material	Quantity
Enriched uranium	4,542,383.000
Depleted uranium	98,178.000
Plutonium	37,187.000

Exports of Reactors and Reactor Components

According to NRC officials, no nuclear power reactors were exported to EURATOM or Japan from 1980 through 1994. However, NRC issued licenses for the export of four major reactor components to EURATOM in 1986, 1991, and 1992. These components were for use in research and in nuclear power reactors. In addition, the United States has exported nuclear reactor equipment and components to Japan annually between 1980 and 1994 under NRC's general licenses.

Dollar Value of U.S. Nuclear Exports to Euratom and Japan From 1989 Through August 1994

We obtained the dollar values of the uranium and plutonium exports from the Department of Commerce's National Trade Data Bank. However, this database excludes the costs of loading the merchandise aboard the exporting carrier and of freight, insurance, and any other charges or transportation costs incurred beyond the port of exportation. The reliability of the data also depends on the accuracy of the reporting by shippers on their export declarations. According to the Department of Commerce's database, the dollar value of U.S. exports to EURATOM countries of uranium (natural, enriched, and depleted) and plutonium in 1989 through August 1994 was about $1.1 billion. The value of these U.S. exports to Japan for the same period was about $4 billion.

U.S. Uranium Enrichment Services

According to U.S. nuclear industry officials, the value of the services related to exported nuclear materials, such as uranium mining, enrichment, and fuel fabrication, should be factored into the value of U.S. nuclear exports. In the past, DOE provided uranium enrichment services to EURATOM and Japan. In 1993, uranium enrichment services were transferred to the U.S. Enrichment Corporation (USEC), a government-owned corporation, which was created to operate the U.S.-owned uranium enrichment plants and to market enrichment services. We contacted DOE and USEC to obtain the amount billed to

EURATOM and Japan for enrichment services from 1989 through 1994. According to information from DOE, EURATOM was billed a total of $167,527,507 for enrichment services in fiscal years 1989 through 1993. Japan was billed a total of $1,593,567,205 for the same period.

The amounts billed by DOE included the cost of enriching the uranium delivered to the enrichment plant and of packaging and handling the services at the enrichment plant. The enriched uranium is delivered to the customer at the enrichment plant, but its cost does not include the cost of any subsequent services, such as fabricating reactor fuel assemblies. According to USEC, the amount billed under Japanese contracts for the period from 1989 through 1994 was $350 million to $400 million per year.

U.S. Nuclear Industry's Views on Potential Impact of Nonrenewal of Agreement on Nuclear Commerce With Euratom and Japan

Industry representatives anticipate that if the U.S.-EURATOM agreement is allowed to expire, EURATOM and Japan would turn to suppliers of nuclear products and services outside the United States. U.S. participation in the European nuclear markets would be greatly reduced. In addition, because Japan also exports U.S.-origin spent fuel to EURATOM for reprocessing, Japan would be less likely to purchase uranium fuel sources from the United States in the future. The absence of a U.S.-EURATOM agreement would prohibit Japan from transferring this U.S.-origin spent fuel for reprocessing in any EURATOM country.

Furthermore, these industry representatives point out that nuclear commerce includes establishing and maintaining relationships with customers and guaranteeing reliable supplies and services to them. A break in any of these ties, such as a failure to renew the U.S.-EURATOM agreement, would weaken the U.S. nuclear industry substantially, because the industry needs both its domestic and foreign markets. According to U.S. nuclear industry representatives, the nuclear industry is a market industry that can exist only in a global environment.

According to USEC officials, if the U.S.-EURATOM agreement for cooperation expires, USEC's future enrichment services would be seriously affected. Specifically, existing contracts with EURATOM, worth approximately $160 million, could be terminated. Other contracts, valued at approximately $470 million, would be in jeopardy. Another $1.8 billion in potential new business from EURATOM and Japan might be lost. According to a nuclear industry representative, the U.S. share of the European nuclear industry market currently is about $100 million and may reach $300 million annually after the year 2000. In addition, Japan

currently is the largest single foreign purchaser from U.S. suppliers of nuclear power systems equipment, materials, and services. In the next 5 years, according to industry officials, anticipated U.S. participation in construction, equipment, start-up services, spare parts, and fuel for 10 nuclear power plants in Japan is expected to amount to about $500 million to $800 million annually throughout the plants' lives.

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